



U.S. Department of Energy

P.O. Box 450, MSIN H6-60
Richland, Washington, 99352



11-WTP-346

OCT 03 2011



Mr. R. W. Bradford,
Deputy Project Director/Project Manager
Bechtel National, Inc.
2435 Stevens Center Place
Richland, Washington 99354

Dear Mr. Bradford:

CONTRACT NO. DE-AC27-01RV14136 – THE U.S. DEPARTMENT OF ENERGY, WASTE TREATMENT AND IMMOBILIZATION PLANT (DOE-WTP) SURVEILLANCE REPORT S-11-WED-RPPWTP-042; REVIEW OF PRETREATMENT FACILITY (PTF) VESSEL VENT PROCESS (PVP) SYSTEM HEADER PIPE INSTALLATION IN PLANNING AREA 7

Reference: DOE letter from S. Charboneau to F. M. Russo, BNI, "Approval of Bechtel National, Inc. (BNI) Justification for Continued Design, Procurement, and Installation (JCDPI) 24590-PTF-JCDI-ENS-11-0002, Revision 0, Design and Procurement of PVP/PVV Equipment in Advance of Testing Completion and Hazards Analysis, 11-NSD-070, dated September 20, 2011.

In the referenced letter, DOE indicated it planned to provide a separate letter to address the continued PVP piping system design, fabrication, and installation until BNI has completed its evaluation and testing of the PVP system to determine if the PVP system is properly sized to maintain an active confinement safety function. In support of this planned letter, the WTP Engineering Division (WED) performed a review to investigate Bechtel National, Inc.'s (BNI) recent installation of PVP system piping in PTF Planning Area 7. Attached, is a copy of the surveillance report documenting this review. Based on this review, and DOE concerns regarding BNI's process for implementing safety function changes, a Priority Level 2 finding is identified in this letter, requiring a written response.

The currently designed and installed PVP piping in PTF Planning Area 7, supports an active safety function that assumes Multiple Sparger or Pulse Jet Mixer Overblow (MOB) controls are added to the PDSA. However, these MOB controls were not addressed in the PDSA. This indicates a broader concern with BNI's configuration management of safety and design when changes are made after initial design is approved and issued.

Mr. R. W. Bradford
11-WTP-346

-2-

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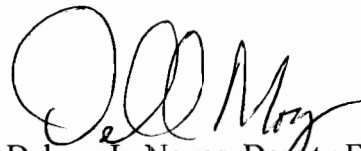
A Priority Level 2 Finding is cited in this letter (finding S-11-WED-RPPWTP-F01) for not keeping the WTP safety basis and design adequately aligned. DOE is concerned BNI's Design Verification and Authorization Basis Maintenance programs lack sufficient guidance to address when AB requirements are changed after the associated design is issued for procurement/issued for construction (IFP/IFC).

Within 14 days of receipt of this letter, BNI should respond to the Priority Level 2 finding discussed above and in the following Notice of Finding. For the finding, provide a corrective action plan that includes: 1) immediate and remedial actions to correct the specific deficiencies identified in the finding; 2) the extent of condition, including a summary of how the extent of condition was established; 3) the apparent cause(s) of the finding; 4) corrective actions to correct the condition and cause(s) to prevent further findings; and 5) the date when all corrective actions will be completed, verified, and compliance to applicable requirements achieved. This response should address the three related observations identified in the attached report.

This letter is not considered to constitute a change to the Contract. In the event BNI disagrees with this interpretation, it must immediately notify the Contracting Officer orally, and otherwise comply with the requirements of the Contract clause entitled 52.243-7, "Notification of Changes."

If you have any questions, please contact me, or you may contact Gary E. Brunson, Director, WTP Engineering Division, (509) 376-2477.

Sincerely,



Delmar L. Noyes, Deputy Federal Project Director
Waste Treatment and Immobilization Plant

WTP:END

Attachment

cc w/attach:

D. Kammenzind, BNI
J. Weamer, BNI
BNI Correspondence

OCT 03 2011

Notice of Finding

Contract No. DE-AC27-01RV14136, Section C, Standard 9, *Radiological, Nuclear, and Process Safety*, paragraph 2 states: "The contractor's integrated standards-based safety management program shall be developed to comply with the specific nuclear safety regulations defined in the effective rules of the 10 CFR 800 series of nuclear safety.

10 CFR 830, Subpart B, paragraph 202(c)(1) requires contractors to update the safety basis to keep it current and to reflect changes in the facility.

Contract No. DE-AC27-01RV14136, Section C, Standard 9, Table S9-1, *Radiological, Nuclear, and Process Safety Deliverables*, requires the contractor to maintain the PDSA current to within 60 days of design.

Contract No. DE-AC27-01RV14136, Section C, Standard 7(e) (3), required BNI to develop a QA Program documented in a QA Manual.

BNI's Quality Assurance Manual, 24590-WTP-QAM-QA-06-001, Revision 9, Policy Q-05.1, *Instructions, Procedures, and Drawings*, Section 5.1.2.1, required work to be performed in accordance with instructions, procedures, or drawings that include or reference appropriate quantitative or qualitative acceptance criteria for determining that prescribed results have been satisfactorily attained.

Contrary to the above, BNI's Authorization Basis program and Design Verification program are not adequate to ensure Authorization Basis requirements are adequately aligned (in a timely manner before material installations), with applicable facility design after the design has been issued for procurement/issued for construction (IFP/IFC). Specifically, BNI installed PTF PVP piping in Planning Area 7 in late July 2011 when the design of this piping was not in accordance with the Preliminary Documented Safety Analysis (PDSA). BNI had identified this condition in May of 2011. Furthermore, as of September 30, 2011, BNI continued to install PVP piping that was not in compliance with the approved safety basis. (Finding **S-11-WED-RPPWTP-F01**)

Attachment

11-WTP-346

Review of Pretreatment Facility (PTF) Vessel Vent Process (PVP) System Header Pipe Installation in Planning Area 7

September 23, 2011

Report Number: S-11-WED-RPPWTP-042

Pages 10 (Including Coversheet)

WED Surveillance Report

Report Number: S-11-WED-RPPWTP-042

Title: Review of Pretreatment Facility (PTF) Vessel Vent Process (PVP) System Header Pipe Installation in Planning Area 7

Date: September 12-23, 2011

Surveillance Lead: Elaine Diaz, HVAC and Process Gas Treatment Safety Systems Oversight, DOE WTP Engineering Division

Team Members/Observer:

Brandon Gadish, Control Systems Safety Systems Oversight, WTP Engineering Division
Brad Eccleston, Facility Representative, WTP Construction Oversight & Assurance Division
Hans Vogel, Environmental Health and Safety Lead, WTP Project Management, Observer

Scope:

A large piping module was installed in the PTF Planning Area 7 in late July, including a section of 16" SC-I, Safety Class PTF PVP system header piping (see Figures 1 & 2 below):

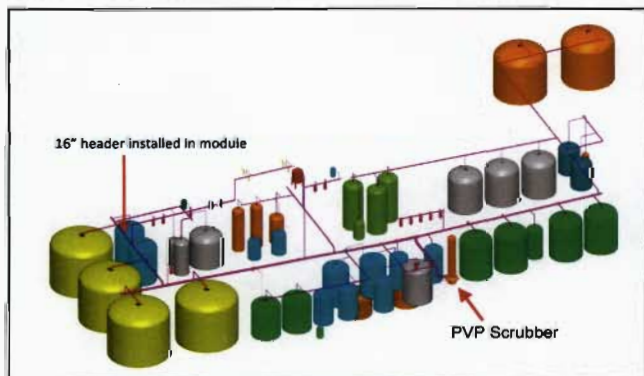


Fig. 1, Model view showing installed section



Fig. 2, 16" header, looking south, PWD black cell

The safety function of the PTF PVP system was changed by a 2009 Preliminary Documented Safety Analysis (PDSA) Addendum, 24590-WTP-PSARA-ENS-09-0001, and the associated Department of Energy (DOE) Approval Letter, 09-NSD-044. However, the design of the system had been in flux since transmittal of these documents. More details of the history of this issue can be found on Project Risk ENG-151 and Technical Issue cut sheet 2010-0001.

The PTF PVP system pipe in Planning Area 7, as installed, supports an active safety function of the system (either case 3 or 4 from CCN: 234433). The pipe is SC-I and Safety Class. Both of the scenarios cited in CCN: 234433 assume Multiple Sparger or Pulse Jet Mixer Overblow

(MOB) controls are added. However, these controls do not yet exist in the PDSA. The need for MOB controls was identified by Bechtel National, Inc. (BNI) engineering in May 2011, including proposed controls (ref. CCN: 234424).

Without MOB controls, the PTF PVP System would need to be sized to accommodate the flow associated with MOB conditions. This may require increasing the size of the PVP header enough to nearly double the airflow (from 4000 to 7000 scfm).

The surveillance team investigated this potential PVP header undersized condition, walked down the installed section of piping, reviewed BNI's path forward, and assessed the scope of BNI's extent of condition regarding other inconsistencies between design and Authorization Basis documents. It also examined BNI's process for addressing similar situations where accident mitigations strategies may not be reflected in design, procurement, and installation.

Design Documents Reviewed:

- 24590-PTF-JCDPI-ENS-11-0002, Rev. 0, August 24, 2011
- 24590-WTP-PIER-MGT-10-0365-C, current version in PIER module as of September 12, 2011
- 24590-WTP-PIER-MGT-11-0761-B rev 0, E&NS PIER
- 24590-WTP-GPP-SREG-002, E&NS Screening and Authorization Basis Maintenance, Rev. 23D, June 15, 2011
- 24590-WTP-3DP-G04B-00001, Design Criteria, Rev. 16, July 5, 2011
- 24590-WTP-GPG-ENG-0108, Design Criteria Database Maintenance, Rev. 4, March 1, 2011
- 24590-WTP-QAM-QA-06-001, Quality Assurance Manual, Rev. 9, September 31, 2011
- 24590-PTF-M6C-PVP-00002, Vessel Vent System Line Calculations, Rev. E, October 30, 2008
- 24590-WTP-PSARA-ENS-09-0001, Rev. 1, PDSA Addendum, October 29, 2009
- Letter 09-NSD-044, Addendum Approval Letter with Conditions of Acceptance, November 02, 2009
- DCD Notification of Change Documents and Impact Voting Records:
 - DCD Change (Rev. 3): CCN: 225676
 - Responses: CCN: 231136
 - DCD Change (Rev. 1)): CCN: 205871, January 19, 2010
 - Responses: CCN: 215958, March 24, 2010
- Mechanical and Process Engineering Design Verification Facility Incomplete and Open Action Items Report for Mechanical Systems, printed September 14, 2011
- CCN: 234424, Preliminary Controls to Protect PVP/PVV and C5V, May 31, 2011

Discussion of Area(s) Reviewed:

The surveillance team performed reviews of the governing requirements; interviewed BNI personnel regarding the scope and path forward of the follow up actions and the impact of this PTF PVP system installation, and performed reviews of pertinent sections of the pipe sizing calculation. The surveillance team performed an independent calculation of PVP header pipe sizing, to determine impact to design margin if MOB controls were not feasible.

Requirements/Process Review:

The following discussion describes the key requirements that address Design Verification and Authorization Basis Maintenance. BNI had a sound process for controlling issuance of design to ensure no design documents were issued until they were compliant with the Authorization Basis.

Design Verification (DV):

BNI's Quality Assurance Manual (QAM) required the design to be verified prior to release for procurement or construction unless this timing could not be met, in which case the design agency is required to identify and control unverified design elements and complete DV prior to the system or component performing its function and before installation becomes irreversible (i.e. requires extensive demolition and rework) (ref. QAM section 3.1.2.8.4).

BNI design control procedures were clear that design media may not be issued for procurement or construction until they are fully compliant with the Authorization Basis.

Authorization Basis (AB) Maintenance:

When the AB is modified by BNI in an Authorization Basis Amendment Request (ABAR), Justification for Continued Design, Procurement, and Installation (JCDPI), or PDSA Addenda, Environmental and Nuclear Safety (E&NS) has 60 days to flow that down into the AB. Upon revision of an AB document, Project Document Control notifies the Design Criteria Database (DCD) Manager. A DCD Notification of Change is written, to which responsible design personnel must respond within 60 days, identifying impacts to design. These impacts are then managed within the normal trending, risk, and design change processes. BNI's procedures contain no requirement to individually track affected design elements that have already been issued for procurement or construction prior to the AB change.

To summarize the process review, there is a requirement not to issue non-AB-compliant design documents for procurement or construction, but there is no requirement to stop installations or procurements already underway when the AB is revised, nor is there a requirement to track affected design elements to prevent irreversible installations. The DCD Notification of Change process serves to notify engineering disciplines via the Integrated Project Teams (IPT), which then are responsible for identifying impacts to design and taking appropriate actions. These

issues are managed via the CPR 4.4 database, known as the Safety Systems Reconciliations Actions, as well as the Project's risk, trending, and cut sheet programs.

In the case of the PVP system, the design was issued for procurement/construction (IFP/IFC) as a passive system post seismic design basis event (DBE). The system was compliant with the AB until the AB was changed in 2008 and 2009, upgrading the post-DBE function of the system to active, and changing key inputs that formed the basis of the inputs to the system calculations.

The redesign of PVP was placed on hold between the 2008 Decision-to-Deviate and the 2009 PDSA Addenda, pending the outcome of the Material at Risk/Hydrogen in Piping and Ancillary Vessels changes. The impactful changes to the PDSA addenda were subtle, so, although engineering did receive the DCD Notification of Change in a timely manner and immediately reported that there were impacts to design, the affected engineering disciplines did not immediately recognize the broad impacts of the change upon notification. These impacts were discovered in the process of attempting to implement the changes in a design change.

The redesign efforts to attempt to comply with the PDSA addenda were stopped, due to a project risk decision, when it was recognized that the redesign would be a major impact to PTF (additional floor), and an integrated path forward was adopted. This integrated approach included a test to determine realistic accident challenge conditions to equipment, characterization of performance of system equipment under accident conditions, and reconsideration of PDSA requirements given additional information from these efforts, in addition to consideration of limited redesign options. This path forward was documented on Technical Issues Cut Sheet 2010-001, Risk Assessment Sheet ENG-151, and in CCN: 234433.

The issued PVP system line sizing calculation was designated as "committed," allowing for issuance of final design, yet contained eleven unverified assumptions. These assumptions were being tracked in the Design Verification database tool known as CALCTRAC.

It should also be noted that engineering did not identify the need for MOB controls until very late in the process of reviewing options...May 2011. The design was screened in February 2010 for impacts due to increased flow, but Mixing was then thought to be the only potential driver for a significant increase to system flow, and it was later determined that the Mixing impact was not significant. It was the combination of the appreciation of the impacts to the C5V confinement ventilation system and the aerosol test planning process that brought this issue (potential PVP header undersized pipe) to light.

Numerous extenuating circumstances, such as those described above, and the realization by engineering that the PDSA controls required by the 2009 PDSA Addenda were too impactful to be implemented in the design, led to a two-year gap during which the PVP system had been unable to meet Authorization Basis requirements.

The first PVP system piping module was installed in Planning Area 7 in late July. The lack of MOB controls in the AB brings into question whether this pipe was undersized.

This issue was identified by BNI and added to Project Issues Evaluation Report 24590-WTP-PIER-MGT-10-0365-C as action items 15 and 16. Because this issue was identified by BNI, no finding is cited. However, the cover letter to this surveillance report will require BNI to provide a written response describing its path forward to address this PVP system piping installation issue.

A second piping module is scheduled to be installed in PTF at the end of September. However, this module does not contain PVP header piping. In late October, a PTF piping module in Planning Area 1 will be installed which will contain several additional sections of potentially under sized PVP header piping (see attached "PVP Piping in Modules to be set Nearterm").

Because the pipe sizing issue had not been addressed with addition of adequate MOB controls in an AB change document, future PTF PVP pipe installation is currently at risk.

Where Authorization Basis requirements change after the associated design is IFP/IFC, especially when broad changes such as is the case for the PVP system are pending (but before they happen), a robust discussion between BNI E&NS and the responsible IPT would reduce risk to the project and ensure requirements changes are fully evaluated up front. The discussion would include a clear definition of the change in terms of functional requirements expected of the system, and the impact of the proposed change on the issued design, procurement, and construction. (Observation **S-11-WED-RPPWTP-042-O01**)

Where Authorization Basis requirements change after the associated design is IFP/IFC, and impacts are identified to issued design elements, in order to prevent irreversible installations as required by the Waste Treatment and Immobilization Plant (WTP) QAM, there should be a process for clearly tracking and identifying affected elements. (Observation **S-11-WED-RPPWTP-042-O02**)

Requirements Excerpts:

ASME NQA-1-2000, Requirement 3, Design Control, Section 500, Design Verification:

"...performed prior to release for procurement or construction unless timing cannot be met, such as when insufficient data exist. Then, identify and control unverified design and complete prior to use."

Excerpt from Table S9-1 of Contract, Page C-86

Deliverable	References	During Construction	Start of Commissioning
Maintain PDSA current to within 60 days of design (Note 1)	10 CFR 830, Subpart B, DOE-STD-3009, Change Notice 3	Revision	Revision
Submit Justification for Continued Design, Procurement, and Installation. (Note 2)	10 CFR 830, DOE-STD-3009, and DOE Guide 421.1-2, Section 4.1.1.4	Revision	N/A

Note 1) Those portions of the PDSA that must be kept current are:

- Chapter 2, Facility Specific Descriptions as noted: Facility descriptions currently in Chapter 2 of the facility specific volumes of the PDSA that provide information on the safety significant systems SSC shall be maintained current with Chapter 4, ITS SSC. The remainder of Chapter 2 does not have to be maintained current. However, ORP expects BNI to establish a process

that minimizes the delta between Chapter 2 and the design such that transition to the Documented Safety Analysis is not a significant task.

- Chapter 3, Hazard and Accident Analysis, except Operational Risk Assessment (ORA) and seismic probabilistic risk analysis.
- Chapter 4, Important to Safety (ITS) Systems Structures, and Components.
- Chapter 5, Derivation of Technical Safety Requirements.

Note 2) JCDPI are only required if the Contractor determines that continuing procurement and installation is in the best interest of the DOE while the Authorization Basis Amendment is being reviewed and approved by DOE.

24590-WTP-QAM-QA-06-001, *Quality Assurance Manual*, pages 03.1-5, xxiii

“Design verification shall be performed prior to releasing the design for procurement, manufacture, construction, or use by another design organization except where this timing cannot be met...In those cases, the unverified portion of the design shall be clearly identified and controlled...In all cases the design verification shall be completed prior to relying upon the SSCs or computer programs to perform its function and before installation becomes irreversible (i.e. requires extensive demolition and rework).”

“Engineering evaluates the impact of design changes for material in procurement, construction, and operations. After the design change documents have been approved, engineering coordinates with procurement, construction, and operations to identify the appropriate method to implement the change.”

Ref. Procedures:

24590-WTP-GPP-SREG-002, E&NS Screening and Authorization Basis Maintenance, Rev. 23D, June 15, 2011

24590-WTP-3DP-G04B-00001, Design Criteria, Rev. 16, July 5, 2011

24590-WTP-GPG-ENG-0108, Design Criteria Database Maintenance, Rev. 4, March 1, 2011

Personnel Interviews:

During an interview between the DOE-WTP surveillance team and BNI staff on September 14, 2011, the team evaluated the planned extent of condition review. The BNI Point of Contact for the extent of condition review planned to review all of the thirteen CPR 4.4 issues and determine for each issue if procurements or installations are impacted. This review will include an examination of how each of these risks are being managed, and is expected to take 2-3 weeks to accomplish.

The DOE-WTP surveillance team agreed this proposed scope was adequate to determine if similar issues exist elsewhere on the project. For additional assurance, the surveillance team recommends DOE-WTP perform an independent review of the extent of condition upon completion of BNI's review (Assessment Follow-up Item **S-11-WED-RPPWTP-042-A01**).

During the interviews, the DOE-WTP surveillance team also determined that the Hazards Analysis Meetings (a.k.a. “HAZOPs”), to review the need for and feasibility of BNI Engineering's proposed MOB controls, were not currently scheduled. The Planning Area 7 piping module, installed in late July, was the first of many to be installed, with the next module containing PVP header piping scheduled for installation in late October. Although E&NS may be waiting for results from ongoing test efforts, a HAZOP to determine if controls proposed by Engineering in CCN: 234424 were feasible could reduce the significant risk associated with the future installation of PTF piping modules. (Observation **S-11-WED-RPPWTP-042-O03**)

Calculation Review/Alternate Calculation/Impact Study:

The surveillance team reviewed Calculation 24590-PTF-M6C-PVP-00002, Vessel Vent System Line Calculations, and the inputs and methodology were used to determine potential impact to the system fan sizing if the header installed in Planning Area 7 was to remain 16" diameter, as currently sized, and the system flow was to increase to accommodate multiple over blows in the absence of controls to prevent or mitigate MOB. The resulting increase in system pressure drop and fan static pressure associated with this one section of installed pipe would be 4 to 6 inches water column. The fan sizing design margin was 15 inches. Therefore, this single installation is not necessarily non-compliant or a non-starter for any active design option without MOB controls, but it consumed roughly 1/3 of the design margin for the system as a whole.

During the walk-down of the system September 22nd, it became clear that since installation of the piping module, short sections of pipe (10-20') had been welded to the header extending it through the hot cell wall. The calculation above assumed the entire 100' length of this section of pipe header was installed, so this additional header installation does not change the surveillance result. However, it is of concern that additional pipe has been installed even while DOE-WTP and BNI are investigating this issue (see Figures 3 & 4 below).



Fig. 3, PVP header on N wall hot cell (above C5V)



Fig. 4, PVP header penetrating S wall PWD vessel cell

There were numerous piping modules to be installed in PTF over the coming months, with nearly all of them containing sections of the PVP header piping. Yet, BNI's Nuclear Safety and Engineering has yet to determine if proposed MOB controls are feasible. Further installation of piping and pipe modules containing header piping is unadvisable until controls are implemented to address MOB.

Summary of Observations, and Assessment Follow-up Item:

1. Observation **S-11-WED-RPPWTP-042-O01**: Where Authorization Basis requirements change after the associated design is IFP/IFC, especially when broad changes such as is the case for the PVP system are pending (but before they happen), a robust discussion between BNI Environmental and Nuclear Safety and the responsible IPT would reduce risk to the project and ensure requirements changes were fully evaluated up front. The discussion would include a clear definition of the change in terms of functional requirements expected of the system, and the impact of the proposed change on the issued design, procurement, and construction.
2. Observation **S-11-WED-RPPWTP-042-O02**: Where Authorization Basis requirements change after the associated design is IFP/IFC, and impacts are identified to issued design elements, in order to prevent irreversible installations as required by the WTP QAM, there should be a process for clearly tracking and identifying affected elements.
3. Observation **S-11-WED-RPPWTP-042-O03**: Hazards Analysis Meeting, aka HAZOP, to determine if controls proposed by Engineering in CCN: 234424 are feasible, could reduce the significant risk associated with the future installation of PTF piping modules.
4. Assessment Follow-up Item **S-11-WED-RPPWTP-042-A01**: DOE-WTP to perform an independent review of BNI's extent of condition review planned to review all of the thirteen CPR 4.4 issues and determine for each issue if procurements or installations are impacted.

Conclusion:

DOE-WTP performed a review to investigate BNI's recent installation of PVP system piping in PTF Planning Area 7, given the lack of existing AB controls to mitigate Multiple Sparger or Pulse Jet Mixer Overblow (MOB) incidents.

Assuming the worst-case scenario, in which MOB controls were deemed infeasible, the installation of the Planning Area 7 piping did not preclude active operation of the PVP system to accommodate MOB scenarios. However, system design margin was significantly reduced.

The requirements for Design Verification and Authorization Basis Maintenance programs, that govern the applicable processes reviewed during this surveillance, were all satisfied in the case of the PVP system upgrade in the 2009 PDSA addendum. However, the broad and significant design impacts were not immediately recognized, including this recently-identified MOB control issue and the design remained inconsistent with the PDSA for more than two years.

A (HAZOP) review is necessary to ensure the MOB controls proposed by engineering are feasible and acceptable to E&NS. According to the BNI AB Maintenance procedure, results of this review would then be submitted in the form of a JCDPI or ABAR for DOE-WTP approval. This would mitigate the risk associated with proceeding with PTF pipe module installation. Delaying piping installation or replacing PVP header sections with larger pipe will have a large negative impact to the PTF construction schedule.

At this advanced stage of design and construction, up-front discussions between E&NS and the responsible IPT are necessary when a significant Authorization Basis change is proposed. These discussions would assess the ability of the design to support the proposed controls, and consider the impact to the design and to ongoing procurement and construction activities. Further, to prevent irreversible installations, per WTP QAM requirements, there should be a process for clearly tracking and identifying design elements impacted.

Three observations and one assessment follow-up item were identified during performance of this assessment.

Surveillance Lead:



Date: 9-30-11

**WTP Engineering
Division Director:**



Date: 9/30/11